NEW YORK STATE COLLEGE OF AGRICULTURE CORNELL EXTENSION BULLETIN 1057

Storing Corn

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With the adoption of mechanized harvesting equipment, the practice of growing corn for grain has increased rapidly in New York in the past few years. Some of the increased production comes from farms that had not previously grown corn for grain and some from increased production per farm. Increasing the corn production per farm often presents storage problems because large quantities of corn must be kept in good condition until it is fed or sold.

MOISTURE CONTENT AND VARIETY

Corn that comes out of the crib in good condition must be in good condition when it goes in. Natural drying conditions are seldom satisfactory in late fall and early winter. Corn cribbed with a moisture content of more than 30 percent is not likely to go through the winter without becoming moldy.

Except in unusually favorable years, it is impossible to harvest late-maturing corn varieties with the moisture content of the ears low enough for safe storage in the crib. Planting an early variety usually assures a corn crop that will mature and whose ears will have a moisture content low enough for safe storage. Elevation, latitude, nearness to large lakes, soil differences, and other conditions all affect corn maturity. The variety of corn raised for grain must be selected on the basis of satisfactory maturity for any given set of conditions. Recommendations for early maturing varieties are available from the New York State College of Agriculture, county agricultural agents, and from seed corn distributors.

Corn that is sold as a cash crop must be down to 15 percent moisture before it can be sold without discount. For a cash-grain crop, the grower should use a very early maturing variety.

The grower who prefers to use a later maturing corn for a cash crop should plan to dry the corn artificially.

A corn picker should be adjusted to husk cleanly without shelling. Only cleanly husked corn can be cribbed safely. Husks, silks, or shelled corn in the crib reduce air movement through the corn and prevent proper finishing.

For shelled corn, the picker-sheller or the corn combine must be adjusted to remove all pieces of stalks, cobs, and other material. Any trash in the shelled corn prevents air passage through the corn during drying and storage, and can be the cause of spoilage.

CORN CRIBS

Permanent corncribs

Storing ear corn in a crib is the most practical way to hold corn on many farms. The crib should be placed away from other buildings or trees to allow free circulation of air through and around it. Placing the crib with the long walls exposed to the prevailing wind helps the circulation of air through the corn. The walls must be open to allow the air to circulate freely. Wood slats with openings between them, welded-wire mesh or coarse hardware cloth, or snow fence, if well supported, all make satisfactory crib walls. The floors can be either tight or open, but a wood floor must be far enough from the ground to prevent corn from drawing dampness and to prevent rats and other rodents from finding harbor under the crib. Concrete floors are satisfactory, and it is recommended that they be built with concrete foundations. A concrete floor needs a gravel fill at least six inches thick, and a moisture barrier of roll roofing or some similar material under the slab to prevent ground moisture from getting to the surface of the floor.

The width of the crib is important. In New York State, in most years, corn in cribs that are more than 4½ feet wide may not keep unless it is artificially dried. With wide cribs and natural air drying, some corn is sure to spoil.

Mechanical loading and unloading saves time and labor in getting the corn in and out of the crib. Doors high in the wall and spaced not more than eight feet apart make it possible to fill the crib with an elevator and to distribute the corn throughout the crib with little or no hand spreading, or to fill the crib by shovelling. With hatches in the roof, also not more than eight feet apart, an elevator can load the crib to capacity.

The corn can be unloaded either through a trench made in the concrete floor in which a drag conveyor can be placed or by allowing the corn to feed from the

Figure 1. This well-built crib is narrow to provide good ventilation for all the corn in it, and the tight roof keeps out rain and snow. Concrete piers are an adequate foundation for the 1200-bushel capacity of the crib.

Figure 2. No hand labor is needed to unload this crib. Corn flows directly into the sheller, from which it is elevated into a wagon or truck. Some cribs have a sheller trench with a drag conveyor installed under the floor.

Figure 3. With a slat door, the crib can be unloaded from the bottom even when it is full. When one or two slats are pulled out, it is possible to shovel corn from floor height; when one or two more slats are removed, the corn runs out into an elevator hopper. The hinged outside door prevents moisture from running into the corn and also allows the crib to be sealed or padlocked.

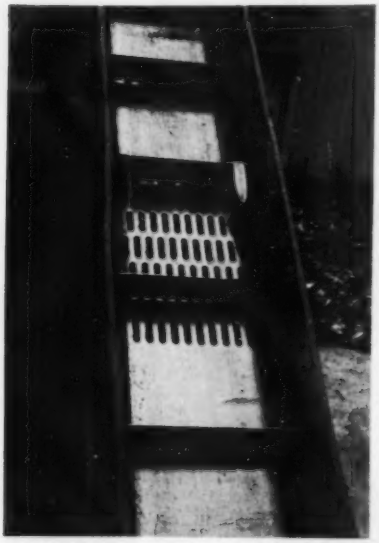


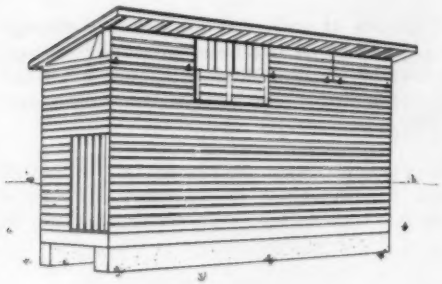
Figure 4. This elevator has a screen to remove shelled corn, pieces of cob, and other debris that would go into the crib and contribute to the spoilage of the corn under the end of the elevator.

Figure 5. Spoilage in this corn crib was very high. The debris that went into the crib with the ears prevented circulation of air through the corn and this condition produced mold and spoilage.

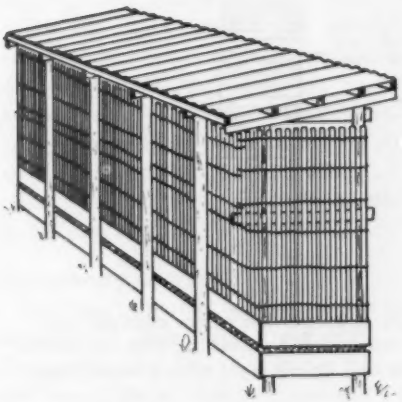
unloading doors in the wall of the crib into an elevator. If the corn is fed in small quantities daily, a mechanized unloading arrangement may not be necessary.

An extension to the upper end of the elevator or an inclined chute with a screen bottom made of two inch square welded wire onto which the elevator discharges, makes a good screen for separating shelled corn, broken pieces of cobs, and other trash from the ear corn. Trash accumulating in the crib reduces air circulation through the corn and increases the possibility of mold. Moving the elevator spout occasionally as the crib is filled prevents accumulation of shelled corn and other debris, which is a common cause of caked and spoiled corn.

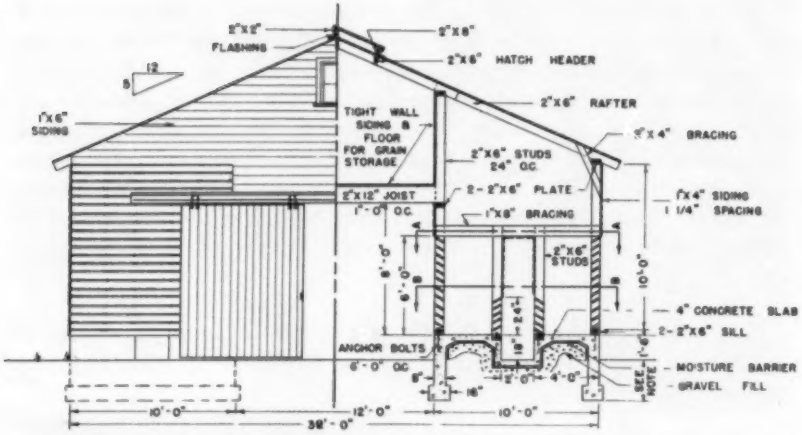
Plans for the following corn cribs are available from the Department of Agricultural Engineering, Cornell University, Ithaca, N. Y. Order by plan number.



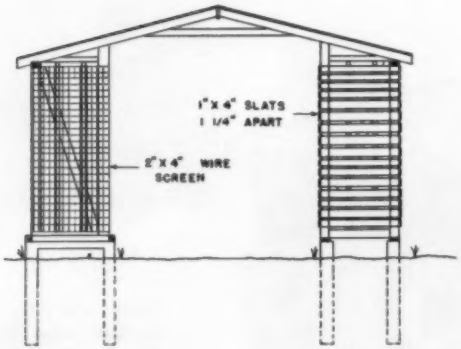
Single corn crib. Capacity 33 bushels of ear corn per foot of length. Plan number 790.



Pole corn crib. Snow fence or woven wire fencing is good temporary siding for a pole corn crib. Roof and floor must be constructed to prevent moisture getting to the corn. Plan number 791.



Double corn crib and granary. Capacity of each side for ear corn storage is 85 bushels per foot of length. Capacity of overhead granary for small grain storage is 48 bushels per foot of length. When ear corn has been artificially dried to 16 to 18 percent moisture, the central ventilation duct can be filled also. Plan number 792.



Double corn crib. Capacity of each crib is 35 bushels of ear corn per foot of length. Either wire screen or slats can be used for walls. The crib on the left is shown with a concrete floor, the one on the right with a wood floor. Plan number 973.

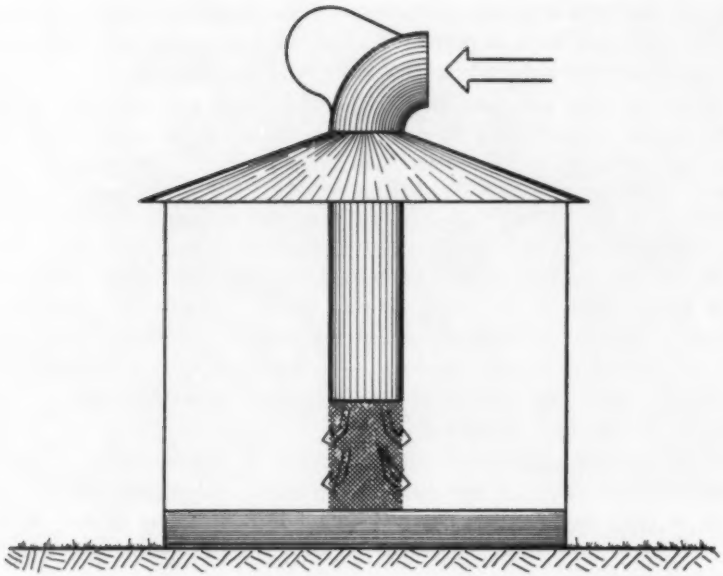


Figure 6. A round steel corn crib equipped with a pressure-type ventilator hood. The addition of the ventilator hood produces positive circulation of air through the corn and greatly reduces the possibility of mold.

Steel cribs

Round steel cribs with wire sides or perforated steel walls are widely used for stroing corn. The usual sizes are 12 feet to 16 feet in diameter, with a center ventilating duct 12 inches to 18 inches in diameter. Few steel cribs have means of circulating air through the corn. Unless the weather is usually good for drying, ear corn put directly into a steel crib from the field is almost sure to develop mold. The condition of ear corn stored in a round steel crib can be greatly improved by adding a rotating pressure-type ventilator hood to the top of the vertical ventilating duct (figure 6). The ventilator hood rotates constantly to keep the intake pointing into the wind, and produces positive circulation of air through the corn.

Temporary corncribs

Low-cost temporary corncribs are satisfactory for storing excess corn from an unexpectedly large crop, or the entire crop on farms with little corn acreage. The requirements for a permanent crib apply equally to a temporary crib: width not more than 4½ feet (the diameter of round cribs should not exceed seven

feet); a floor or a temporary platform set off the ground on timbers or masonry blocks; open side walls to permit air circulation through the corn; and a roof or some other protection to keep rain and snow out of the corn.

Temporary cribs with poles for the upright supports and snow fence or wire mesh for the walls can be built easily and quickly and often at little or no cost. A round crib seven feet in diameter and eight feet high (two widths of snow fence) holds approximately 200 bushels of corn. If it is necessary to provide temporary storage in one crib for more than 200 bushels, the crib should be rectangular in shape and not more than 4½ feet wide. A pole crib with a well-built roof can be expected to last a number of years. For a crib that is to be used for only one or two years, any covering such as reinforced kraft paper, canvas, or other water-proof material, is enough.

Any temporary crib needs to be on a well-drained site and exposed to the prevailing winds. A gravel fill may be needed to prevent dampness from getting into the corn near the floor.

Corn that is well matured before it is brought in may be stored on the barn floor, the mow floor, the tool shed, or any other unused space, but the corn must be piled no more than two feet deep. The doors must be kept open to provide good ventilation. A number of small piles of corn are better than a single large pile.

Figure 7. A well-built pole corncrib is satisfactory for either temporary or permanent storage of ear corn. This crib has a good roof and a floor made of short poles. It is built with three heights of snow fence and home-grown poles. If a pole crib is to be used for a number of years, it will pay to use treated poles, or locust or red cedar poles which do not require treatment to make them decay resistant.

Figure 8. This double corncrib holds from 6,000 to 7,000 bushels of corn and serves as an out-of-season storage for machinery.

RATPROOFING

Lining the crib with ½-inch wire netting prevents rats from getting into the corn. If a crib has a wooden floor, place the wire mesh under the floor to prevent the rats from coming through. Doors, loading hatches, and unloading doors also must be covered.

Concrete floors and foundation walls help to exclude rats from the crib. Wood floors built a few inches off the ground are excellent harbors for rats; this construction should be avoided. In burrowing, rats pile moist earth against the floor joists and sills of cribs set too close to the ground, and cause rapid decay of the floor members.

A strip of sheet metal approximately 12 inches wider than the foundation or sill, with the edges of the metal strip extending about six inches beyond the construction on each side, is an effective rat barrier. For corncribs set on posts or pilings, a metal pail or some other vessel inverted over the post prevents rats from getting past the upper end of the post.

SHELLED CORN STORAGE

Each year more corn is harvested as shelled corn either with picker-shellers or with grain combines equipped with corn attachments. New York weather conditions require that all shelled corn be artificially dried before it can be stored. There are a number of advantages resulting from handling only shelled corn: approximately one-half the space is needed for shelled corn as for ear-corn storage; because artficial drying is necessary, corn harvest can be started earlier than is possible when ear corn is put into cribs for natural air drying; and small quantities of shelled corn can be stored in any unused space where the corn can be protected from moisture.

Because shelled corn must be artifically dried before it can be stored, almost any storage where the corn can be protected from moisture is suitable. A relatively small amount can be stored in a small movable building, in a large bin in an existing building, or on an unused part of the barn floor or the mow floor in an unused building. If corn is stored on a wooden floor, additional supports may be required under the floor. On farms producing several thousands of bushels of shelled corn each year, a granary large enough for the needed storage, or a number of pre-fabricated metal bins, may be the most economical. Upright silos reinforced to hold grass silage also are suitable for storing shelled corn if an aeration system is added.

Requirements for adequate shelled corn storage

Shelled corn weighs 70 pounds per cubic foot at 14 percent moisture, which is safe moisture content for storage. For example, a three-foot depth of corn is a load of 210 pounds for each square foot of floor. Greater depths of shelled corn put a proportionately greater load upon the floor. Because of the heavy load concentration, floors built off the ground must be well supported. Side walls of bins and storage buildings also must carry heavy loads and must be equally well built. When shelled corn storages are being planned, or when existing buildings are to be remodelled into storages, plans or recommendations of a qualified engineer, or the construction details of an existing storage should be followed to avoid failure of the building. Some considerations of the location and construction of a shelled corn storage are as follows:

The storage should be located near buildings where the corn is to be used. The site should be dry and accessible in all seasons. If a drier is to be used with the corn storage, the location should not constitute a fire hazard to other buildings.

Mechanical loading and unloading of the storage should be planned before construction is begun. The storage should be convienient to load and unload.

The storage should be structurally sound and weathertight. When exposed to snow or rain, shelled corn can absorb moisture rapidly. Reabsorption of moisture will cause quick spoilage.

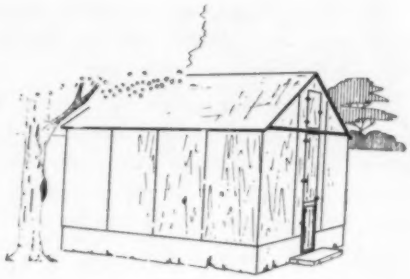
When the storage is built on a concrete floor set on the ground, the floor must be protected against ground moisture. Choose a high, well-drained location, put at least six inches of gravel fill under the concrete, and put a waterproof membrane under the concrete and above the gravel fill. Eavetroughs with a drain tile system to conduct rain water away from the site are further insurance of a dry floor.

Plans for the following shelled corn storages are available from the Department of Agricultural Engineering, New York State College of Agriculture, Ithaca, New York.

600-bushel portable bin. Skid mounted, 10 feet by 10 feet by 8 feet, bin filled through gable end. Wood sheathing; siding and roofing type optional. MW73251.

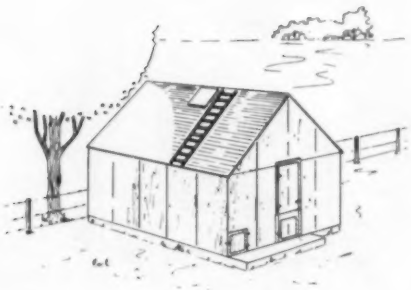
1,000-bushel portable bin. Skid mounted 12 feet by 14 feet by 8 feet deep bin filled through roof hatch or gable end door. Wood sheathing; siding and roofing optional. MW73252.

1,200-bushel bin. Exterior plywood directly over studs provides rigidness and strength in single layer side walls; 12 feet by 16 feet by 8 feet deep, building is rodent proofed. MW73253.



1,500-bushel bin; 12 feet by 20 feet by 8 feet deep frame building with optional roofing and siding added over wood sheathing. Rodent proofed. MW73254.

2,000-bushel bin; 16 feet by 20 feet by 8 feet deep. Bin with plywood walls and roof sheathing. Rodent proofed. MW73255.



Aeration of shelled corn in storage

An arrangement for aerating shelled corn is necessary if it is stored for more than 30 to 60 days. Small amounts can be turned over with a shovel occasionally, but larger storages must be mechanically aerated. If an empty bin is available, the corn can be moved from one bin to another with the conveyors used to load and unload the bins. This arrangement is costly because of the extra bin capacity that must be available. A more economical arrangement is to install a fan ventilation system in the storage to force air through the stored shelled corn. Air movement at the rate of 1/10 to 1/4 cubic feet of air per minute per bushel of stored corn is sufficient. After the storage is filled, the fan should be run on cold, dry days to lower the temperature of the corn. Later the fan needs

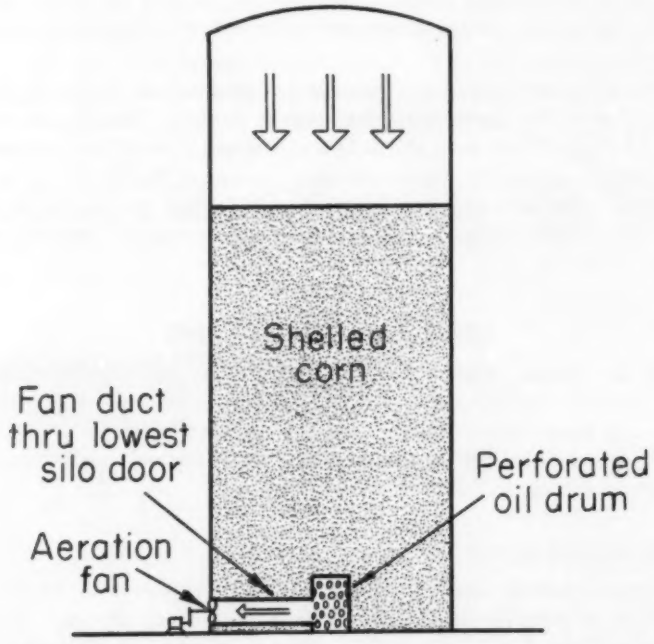


Figure 9. Adapting a silo for storing shelled corn. The aeration system consists of a perforated oil drum set upright on the silo floor. A circular duct connects with the oil drum and extends to the outside of the silo thru the lowest silo door. The duct should be the same diameter as the ventilating fan. A 16- or 18-inch ventilating fan is satisfactory.

to run only for two or three hours, two or three times a week, to hold the low temperature in the corn. A small diameter pipe with a thermometer attached to one end makes a good probe for learning the temperature of the corn a number of feet below the surface.

Figure 9 shows an aeration system installed in an upright silo. The same system can be modified for use in a round steel bin. The system consists of a well perforated 50 gallon oil drum placed upright on the silo floor and connected to an 18-inch diameter tubular duct. The 18-inch duct extends from the perforated oil drum to the outside of the silo through the lowest door to draw air down through the corn and exhaust it to the outside. An 18-inch diameter barn ventilating fan, running at 1750 revolutions per minute, can move enough air to ventilate a silo 50-feet high and filled with shelled corn. Because most barn ventilating fans are operated with fractional horsepower motors, it will be necessary to replace the original motor with a larger one. This can be done by removing the small motor, putting a pulley on the fan shaft and driving the fan with a larger motor. A one horsepower motor is large enough for a 16 feet x 45 feet silo.

When this system is used in a round metal grain bin, the height of the perforated drum in the center of the bin must be much less than that of the 50-gallon oil drum. There must always be a greater height of shelled corn over the perforated drum than the distance between the side of the drum and the side of the bin. The same fractional horsepower motor that was used to drive the fan as a barn ventilating fan can furnish enough power for aerating shelled corn in a small bin.

ARTIFICIAL CORN DRYING

With the climatic conditions of New York State, the moisture content of newly harvested shelled corn is always too high for storage without artificial drying with heated air. Artificial drying of ear corn is necessary if the corn is to be stored in a wide crib. Artificial drying can assure good quality corn in an unusually late or an unusually wet season.

Drying shelled corn

The grower who harvests shelled corn has several choices of drying facilities. He can use one of the small heated air circulating drying bins now available. Most manufactureres can furnish a circulating drying bin with the large fan operated with an electric motor or from the tractor power-take-off. A forage drying wagon, with a portable heater-drier can be used. It is necessary to place a small mesh screen over the floor of forage wagons before using them for shelled corn. One to two feet of shelled corn is the maximum depth that can

Figure 10. Steel cribs set on foundations and equipped with perforated floors make excellent driers for ear corn or shelled corn. Heated air is admitted to the crib through the perforated floor.

be dried efficiently. Plans for a batch drier, developed by the United States Department of Agriculture are available from the Department of Agricultural Engineering, New York State College of Agriculture, Ithaca, New York, or your county agricultural agent.

Drying ear corn

Artificial drying makes it possible to begin picking before the moisture content of corn is low enough for safe storage. At this stage, it is easier to adjust the picker to remove the husks cleanly than when the husks are dry. Ear corn can be dried either with heated or unheated air. When the outside temperature drops below 50°F., and when the air is damp, drying with unheated air may be too slow to prevent spoilage. Drying with heated air is independent of the weather.

Most ear corn is dried after it has been put into the crib. It is not essential that ear corn be dried immediately after being harvested. A heated air drier can be moved from crib to crib or from farm to farm to dry many thousands of bushels each season.

Figure 11. Drying shelled corn in a forage wagon. With the addition of a screen to the floor, a forage drying wagon makes an excellent batch drier for shelled corn. Two or three wagons can usually dry corn as fast as a picker sheller can harvest the crop. Depth of corn in a drying wagon should not exceed two feet.

A steel crib can be used to dry corn artificially. It must be equipped with ducts on the floor or with a false floor that permits a crop drier to be attached to force air through the corn. The corn can be left in the crib after it is dried, or the crib can be used as a batch drier, if it is equipped with a mechanical unloader.

CORN STORAGE PRACTICES

Do

1. Grow a stiff-stalked corn variety that matures by harvest time.
2. Have your local feed dealer test the corn for moisture when it is cribbed.
3. If the moisture content of newly cribbed corn is more than 30 percent, plan to dry the corn artificially.
4. Dry corn artificially if it is to be sold as a cash crop and if its moisture content is more than 15 percent.
5. Screen out pieces of cobs, husks, and other fine material before the corn goes into the crib.
6. Husk hand-picked corn cleanly.
7. Adjust the corn picker to husk cleanly without shelling.
8. Check the condition of the corn in the crib several times during the winter.

Do not

1. Pile corn on the ground.
2. Build a corncrib more than 4½ feet wide.
3. Make a single large pile of corn 4 or 5 feet deep on the barn floor.
4. Put corn in a temporary crib that has no roof.
5. Put the wooden floor of a corncrib directly on the ground.

An Extension publication of the New York State College of Agriculture, a unit of the State University, at Cornell University, Ithaca, New York

APRIL 1961

Cooperative Extension Service, New York State College of Agriculture at Cornell University and the U. S. Department of Agriculture co-operating. In furtherance of Acts of Congress May 8, June 30, 1914. M. C. Bond, Director of Extension, Ithaca, New York. PS-5M